IS HO_2^+ A DETECTABLE INTERSTELLAR MOLECULE?

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Although molecular oxygen, O_2, has long been thought to be present in interstellar environments, it has only been tentatively detected toward one molecular cloud. The fractional abundance of O_2 determined from these observations is well below that predicted by astrochemical models. Given the difficulty of O_2 observations from ground-based telescopes, identification of a molecule that could be used as a tracer of O_2 in interstellar environments would be quite useful.

To this end, we have begun a collaborative examination of HO_2^+ in an attempt to evaluate the feasibility of its detection in interstellar clouds. The formation reaction for HO_2^+ is nearly thermoneutral, and so a full thermochemical evaluation of its formation mechanism is required. In addition to this uncertainty, no laboratory spectroscopic information is available for HO_2^+, and previous *ab initio* calculations are not sufficiently accurate to guide observational searches. Here, we will present highly accurate spectral predictions based upon the new high-level *ab initio* calculations presented in the preceding talk. We will also report the HO_2^+ formation reaction enthalpy and equilibrium constant, which were obtained from an Active Thermochemical Tables (ATcT) analysis and are the most accurate values available to date. Additionally, we will discuss the potential formation and destruction pathways for HO_2^+ in interstellar environments. Based on this information, we will estimate the HO_2^+ column density in molecular clouds and discuss the feasibility of its detection. Progress on obtaining the high-resolution infrared laboratory spectroscopy on the ν_1 band of HO_2^+ will also be reported.

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